

**PREDATION BY LARVAL SOLDIER BEETLES
(COLEOPTERA: CANTHARIDAE) ON THE EGGS
AND LARVAE OF *PSEUDOXYCHEILA TARSALIS*
(COLEOPTERA: CICINDELIDAE)¹**

Tom D. Schultz²

ABSTRACT: Predation on the eggs and larvae of *Pseudoxycheila tarsalis* by cantharid larvae at Monteverde, Costa Rica is described. Larvae of the subfamily Chauliognathinae were observed repeatedly to forage on clay banks where tiger beetle adults and larvae were abundant. Eggs and larvae of *P. tarsalis* were excavated from the clay banks and consumed by the soldier beetles.

Pseudoxycheila tarsalis Bates, a Neotropical cicindelid, occurs in montane habitats from Costa Rica to Colombia (Palmer 1976). Adults may be found along unpaved roads or on exposed clay banks. Females oviposit by digging a hole 5-7 mm deep on steep or vertical slopes, laying a single egg, and covering it with loose clay. After eclosion, the larvae construct horizontal burrows in the bank, and ambush insects that pass near the burrow opening at the soil surface. Like other tiger beetle species, *P. tarsalis* larvae are parasitized by tephritid wasps and bombyliid flies which attack the larvae within their open burrow (Palmer 1976). Other than parasitoids, few instances of predation on immature stages of tiger beetles have been observed (Mury Meyer 1987, Pearson 1988).

On 4 August 1991 and 10 August 1992, I observed soldier beetle larvae attack and consume eggs and larvae of *P. tarsalis* on a clay slope near the entrance of the Monteverde Cloud Forest Preserve in the state of Puntarenas, Costa Rica. On each day, several cantharid larvae were observed crawling about on the 15 X 20 m slope where the tiger beetles were abundant (Fig. 1 a). The cantharids probed in small crevices or holes they encountered. On one occasion, a cantharid larva located the pile of loose clay that covered a *P. tarsalis* egg laid only 2.5 min before. The cantharid dug out the egg and consumed it. When I moved the same cantharid larvae to within 5 cm of another recent oviposition, it located the second egg and consumed it as well. Two other cantharid larvae repeatedly entered 5 to 6 late instar burrows of *P. tarsalis*. One of the soldier beetles excavated the entrance of a second instar burrow (Fig. 1 b) until its head was inserted to a depth of 25 mm. After 3 min in this position, the cantharid retracted leaving only the macerated head capsule of the cicindelid larva near the burrow entrance.

¹ Received June 25, 1993. Accepted July 24, 1993.

² Department of Biology, Denison University, Granville, OH 43023.

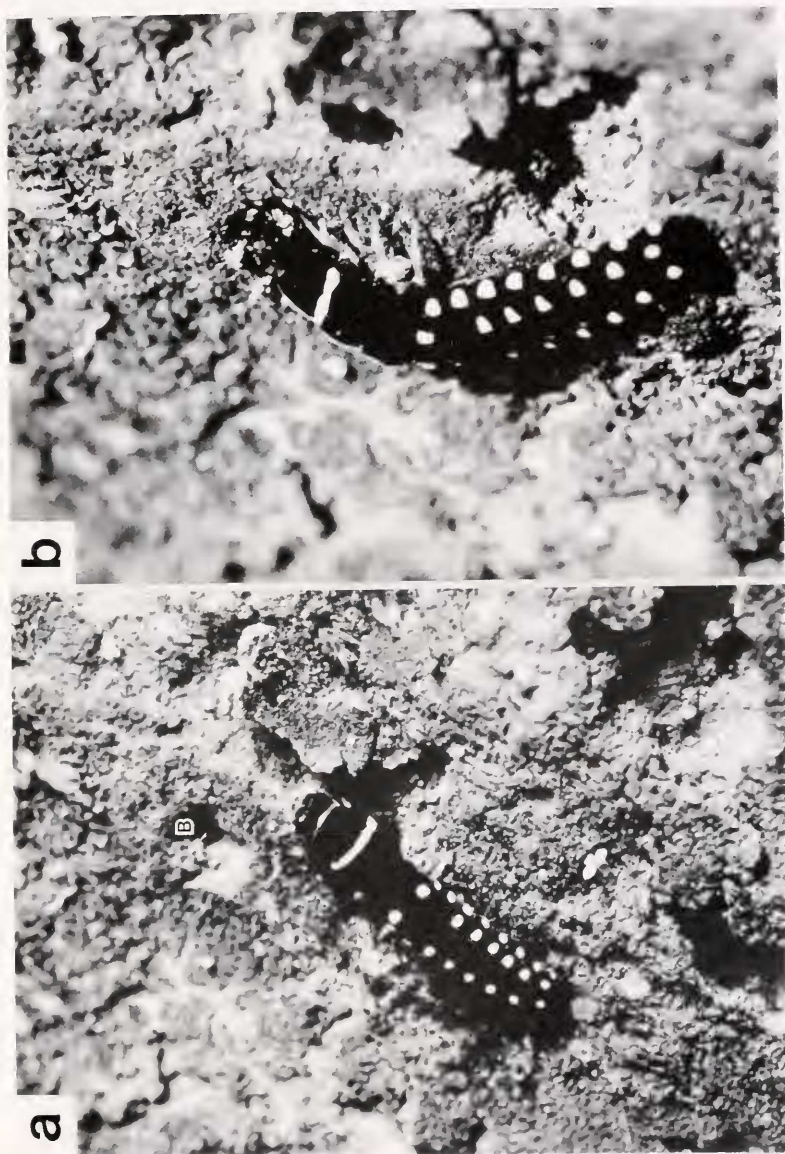


Figure 1. a) Cantharid larva foraging among several larval burrows (B) of *Pseudoxystcheila tarsalis*. b) Cantharid larva excavating a larval burrow of *P. tarsalis*. Within the burrow the cantharid consumed the tiger beetle.

The cantharid larvae belonged to an unknown species in the Subfamily Cauliognathinae (L. LeSage, personal communication). The late instar larvae measured 24-34 mm in length and were velvet black with yellow legs. The posterior margin of the pronotum was white and the 1st and 3rd through 8th abdominal tergites bore two pairs of white lateral spots. The 2nd abdominal tergite exhibited only a single spot on each side. Preserved specimens are in possession of the author.

Chauliognathine larvae are known to prey on other insect larvae (Arnett 1985), but cantharids have not been reported previously to prey on cicindelids. It remains uncertain whether predation by this cauliognathine species could have a significant impact on the population of *P. tarsalis* at Monteverde. First and 2nd instars of *P. tarsalis* may be susceptible to cantharids, but the 3rd instar larvae are themselves formidable predators that can subdue small frogs (Palmer 1976). Predation on cicindelid eggs, here reported for the first time, may be an important limiting factor on tiger beetles like *P. tarsalis* that oviposit in clusters within limited microhabitats. The habit of carefully smoothing over the soil filling the egg chamber has been observed in ovipositing *P. tarsalis* (Palmer 1976) and other cicindelids (Pearson 1988), and may have evolved to prevent the detection of eggs by predators such as cantharid larvae

ACKNOWLEDGMENTS

I thank L. LeSage, Biosystematics Research Institute, Ottawa, Canada for identifying the cauliognathine larva, and the Carolina Ohio Science Education Network (COSEN) for giving me the opportunity to lead the 1991 and 1992 Workshops in Tropical Biology, during which these observations were made.

LITERATURE CITED

- Arnett, R.H.** 1985. American insects. Van Nostrand Rheinhold Co., New York.
- Mury Meyer, E.J.** 1987. The capture efficiency of flickers preying on larval tiger beetles. *The Auk* 98:189-191.
- Palmer, M.** 1976. Natural history and behavior of *Pseudoxyecheila tarsalis* Bates. *Cicindela* 8:61-92.
- Pearson, D.L.** 1988. Biology of tiger beetles. *Ann. Rev. Entomol.* 33:123-47.